

PATENT SPECIFICATION

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(54) DISINFECTANT

(71) I, HANS GOOD, of Casa alle Grotte, Via Cantonale, 6644 Orselina, Switzerland, a Swiss citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a disinfectant. According to the invention, there is provided a disinfectant comprising essential constituents which comprise a germicidal tin organic compound, a germicidal quaternary ammonium compound, an aliphatic dialdehyde of 2 to 5 carbon atoms, and isopropanol.

The germicidal tin-organic compound may be a trialkyl-tin-hydroxide or an ester thereof with a carboxylic acid such as benzoic acid, the alkyl residues preferably being straight chain residues and comprising from 2 to 6 carbon atoms. Preferred tin-organic compounds are tri-*n*-propyl-tin-benzoate, tri-*n*-butyl-tin-hydroxide and especially tri-*n*-butyl-tin-benzoate.

The germicidal quaternary ammonium compound may comprise an ammonium salt which is so selected from trialkyl-aryl and trialkyl-aralkyl-ammonium salts as to ensure that the disinfectant is substantially innocuous to human tissue.

In the quaternary ammonium compound substituents may be present in the aryl residue, and preferred quaternary ammonium compounds comprise alkyl-dimethyl-benzyl-ammoniumchlorides, which may have halogen substituents in the benzyl residue, such as alkyl-dimethyl-3,4-dichlorobenzyl-ammoniumchlorides, the alkyl residue having preferably from 10 to 20 carbon atoms.

The aliphatic dialdehyde is preferably glyoxal or glutaraldehyde.

Where the essential constituents include an emulsifier, the emulsifier may preferably be an alkyl-phenyl-polyethylene-glycolic ether, but other emulsifiers may also be used, such as those already known for the preparation of stable dispersions of organotin com-

pounds in aqueous media. Some such emulsifiers are described in U.S. patent specification 2 957 785.

Where a further constituent selected from salicylic acid and salts thereof is present in the disinfectant, the further constituent may comprise sodium salicylate.

The disinfectants generally used hitherto often have merely a short activity. Their activity often decreases within a few hours to such a degree that persons or objects treated may be reinfected if they come into contact with germ-containing matter. This is especially true for hospital equipment, floors, walls and ceilings in wards, as well as parts of the human body, such as hands or feet. A further disadvantage of the conventional disinfectants is their often relatively slow onset of action. It often takes hours until the desired action starts, which is too long a time in hospitals, especially in emergency cases, e.g. sudden surgical interventions. In unfavourable circumstances both these disadvantages may combine in such a way that sufficient protection against infection is not ensured at all or not during a sufficient lapse of time, e.g. in the case of long operations.

Disinfectants have already been proposed which were intended not to have the above-mentioned disadvantages and to provide a longlasting activity or so-called sanitising effect. Such agents comprised organic heavy metal compounds, such as tin organic compounds, which are not toxic to men and higher animals in the proposed concentrations. However, even these agents may not ensure a sufficiently durable action, or they may irritate mucous membranes and be evil-smelling in the required concentrations so that the staff performing the disinfection may be tempted to reduce the concentration, thus rendering their effect insufficient.

Quaternary ammonium compounds have also been proposed as disinfectants. However, they are generally inactive against several important pathogenic germs, such as viruses or tubercle bacillus. Even more important for

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many modes of application is the disadvantage that they can be inactivated by anions, such as those present in most of the usual soaps, and by proteins.

- 5 The examples of disinfectant described below mitigate the above-mentioned disadvantages, and have proved to be superior to at least some conventional disinfectants in comparative tests. They are distinguished by their rapid onset of action and reliable activity which may extend over several days. They have substantially no odour, and do not irritate mucous membranes. Their components are non-toxic taken separately, as well as in combination. In spite of the fact that their activity is partly due to a quaternary ammonium compound, their action is not impaired by soaps or anions, or by proteins. They may thus be used in lyes, floor cleaning agents, as soap additives, or for disinfecting excrements, pus etc., but they are also convenient for the preparation of sprays for disinfecting products and impregnating fabric, paper, linen, clothes, operation and face masks as well as ventilation filters etc. The disinfectants are active against gram-positive and gram-negative germs, such as *Staphylococcus aureus* (coagulase-positive), *Staphylococcus albus*, *pyozyaneus bacteria* and other kinds of *pseudomonas*, proteus germs, mycobacteria, especially tubercle bacilli and acid-resistant germs, fungi, all spore forming bacteria, including *Tetanus bacilli*, *Bacterium subtilis*, viruses, especially *Variola* and *Icterus* viruses, and *Streptococci*, *Salmonellae* etc.

- 35 The above-mentioned rapidly onsetting and long-lasting activity against a large range of pathogenic micro-organisms is due not only to a balanced composition of germicidal substances, but also to a surprising combination effect which results e.g. in the fact that the quaternary ammonium compound in admixture with the other components is no longer inactivated by anions or proteins.

- 45 In the disinfectant, the tin-organic compound is contained preferably in a quantity of 1 to 10 parts by weight and especially 3 to 6 parts by weight, the quaternary ammonium compound preferably in a quantity of 0.05 to 100 parts by weight and especially 1 to 50 parts by weight, the aliphatic dialdehyde preferably in a quantity of 10 to 200 parts by weight and especially 30 to 100 parts by weight, and the isopropanol preferably in a quantity of at least 10 parts by weight. The emulsifier may be present in a quantity of preferably 1 to 20 parts by weight and especially 2 to 10 parts by weight and the salicylic acid or salt thereof in a quantity of preferably 0.1 to 10 parts by weight and especially 0.6 to 3 parts by weight. All these proportions by weight are related to the total weight of the essential constituents in each particular case.

The disinfectant may be prepared or marketed as a concentrate i.e. in a form such as to be suitable for dilution prior to use, as well as in an alcoholic, alcoholic-aqueous or aqueous carrier medium, ready for use. The alcoholic or alcoholic-aqueous form is especially convenient for the preparation of sprays, isopropanol being preferred as the alcohol.

In the form ready for use, the tin organic compound, especially tributyl - tin - benzoate, is preferably present in a quantity of 1 part by weight to 10 parts by weight. The quaternary ammonium compound is preferably used in a quantity of about 0.05 part by weight to 100 parts by weight; preferred is a mixture of alkyl-dimethyl-dichlorobenzyl-ammonium-chlorides having alkyl residues of different lengths, e.g. a mixture containing 50% of residues having 12 carbon atoms, 30% of residues having 14 carbon atoms, 17% of residues having 16 carbon atoms and 3% of residues having 18 carbon atoms. The aliphatic dialdehyde is preferably present in a quantity of 10 parts by weight to 200 parts by weight, the range of about 10 parts by weight to 100 parts by weight being preferred for glyoxal, and the range of about 20 parts by weight to 200 parts by weight being preferred for glutaraldehyde in the form of a 50% by weight aqueous solution. The isopropanol is present in a quantity of preferably at least 10 parts by weight. This quantity may reach 8000 parts by weight or even more in the case of alcoholic solutions.

In the form ready for use, salicylic acid, sodium salicylate or another salicylate may be present in a quantity of preferably 0.1 part by weight to 10 parts by weight. Furthermore, the disinfectant usually contains an emulsifier, such as an alkyl - phenyl - polyethylene - glycolic ether, which may be present in a quantity of preferably 1 part by weight to 20 parts by weight. Further auxiliary and additional substances or excipients may be present e.g. glycerol, ethanol, sodium bicarbonate or perfumes.

In the disinfectant ready for use the total quantity of the essential constituents lies preferably in the range 5 parts by weight to 1000 parts by weight and especially 10 parts by weight to 300 parts by weight, depending on the particular application and the specific requirements, the quantity of the carrier medium being preferably in the range 9000 parts by weight to 9995 parts by weight, and especially 9700 parts by weight to 9990 parts by weight, related to the total weight of the disinfectant solution. Lower concentrations of the essential constituents are generally preferred for disinfecting tools or commodities, whereas higher concentrations of the essential constituents may be used e.g. for disinfecting walls or floors.

Example 1

The aqueous emulsion of the composition given below having a content of essential constituents of about 300 parts by weight may be used as such or after dilution with water to an essential constituents content of 100 or 50 parts by weight for disinfecting purposes:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	5
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	50
Glyoxal	40
Isopropanol	40
Emulsifier*	9
Sodium salicylate	3
Glycerol	25
Ethanol	130
Water and excipients	9698
	(for a 3% by weight aqueous emulsion)

Example 2

The alcoholic-aqueous emulsion of the composition given below is convenient for use as a spray liquid:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	6
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	50
Glyoxal	40
Isopropanol	7000
Emulsifier*	9
Sodium salicylate	3
Ethanol	130
Water and excipients	2762

Example 3

Composition for an alcoholic spray emulsion:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	6
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	50
Glutaraldehyde (50% aqueous solution)	100
Isopropanol	7000
Emulsifier*	9
Sodium salicylate	3
Water and excipients	2832

Example 4

Composition for a cleaning liquid:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	6
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	50
Glutaraldehyde (50% aqueous solution)	100
Isopropanol	100
Emulsifier*	10
Salicylic acid	3
Detergent and water	9731

Example 5

The concentrate having the composition given below may be diluted with water for use as disinfectant in a proportion of 1:50 by weight to 1:200 by weight:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	300
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	100
Glutaraldehyde (50% aqueous solution)	3000
Isopropanol	1500
Emulsifier*	200
Salicylic acid	60
Perfume	1600
Water	3240

Example 6

An alcoholic spray convenient for disinfecting hospital equipment may have the following composition:

	Parts by weight
Tri- <i>n</i> -butyl-tin-benzoate	4
Alkyl-dimethyl-dichloro-benzyl-ammoniumchloride**	16
Glutaraldehyde (50% aqueous solution)	50
Isopropanol	7000
Emulsifier*	10
Salicylic acid	3
Perfume	1
Water	2916

Example 7

A spray emulsion having the same composition of essential constituents as in Example 6, but which is diluted in a proportion of 1:10 by weight with 70% by weight aqueous isopropanol may be used as a disinfectant in industry, schools etc.

* As emulsifier an alkyl - phenyl - polyethylene glycolic ether is used.
 ** The alkyl - dimethyl - dichlorobenzyl - ammoniumchloride is used as a 60% by weight aqueous solution. It is a mixture wherein the alkyl residues have the following lengths: 50% having 12 carbon atoms, 30% having 14 carbon atoms, 17% having 16 carbon atoms, and 3% having 18 carbon atoms.

WHAT I CLAIM IS:—

1. A disinfectant comprising essential constituents which comprise a germicidal tin organic compound, a germicidal quaternary ammonium compound, an aliphatic dialdehyde of 2 to 5 carbon atoms, and isopropanol.
2. A disinfectant as claimed in claim 1, wherein the essential constituents further comprise an emulsifier.
3. A disinfectant as claimed in claim 2,

wherein the emulsifier comprises an alkyl-phenyl-polyethyleneglycolic ether.

4. A disinfectant as claimed in any one of the preceding claims, wherein the essential constituents comprise a further constituent selected from salicylic acid and salts thereof.

5. A disinfectant as claimed in claim 4, wherein the further constituent comprises sodium salicylate.

10. 6. A disinfectant as claimed in any one of the preceding claims, wherein the tin organic compound is selected from trialkyl - tin - hydroxides and carboxylic acid esters thereof.

15. 7. A disinfectant as claimed in claim 6, wherein the tin organic compound comprises tri-*n*-butyl-tin-benzoate.

20. 8. A disinfectant as claimed in any one of the preceding claims, wherein the quaternary ammonium compound comprises an ammonium salt which is so selected from trialkyl-aryl and trialkyl-aralkyl-ammonium salts as to ensure that the disinfectant is substantially innocuous to human tissue.

25. 9. A disinfectant as claimed in claim 8, wherein the ammonium salt is substituted in the aryl residue.

30. 10. A disinfectant as claimed in claim 9, wherein the ammonium salt comprises an alkyl - dimethyl - dichlorobenzyl - ammoniumchloride.

35. 11. A disinfectant as claimed in any one of the preceding claims, wherein the aliphatic dialdehyde is selected from glyoxal and glutaraldehyde.

40. 12. A disinfectant as claimed in any one of the preceding claims, wherein the essential constituents comprise 1 to 10 parts by weight of the tin organic compound, 0.05 to 100 parts by weight of the quaternary ammonium compound, 10 to 200 parts by weight of the aliphatic dialdehyde, and at least 10 parts by weight of isopropanol.

45. 13. A disinfectant as claimed in claim 12, wherein the essential constituents include 3 to 6 parts by weight of the tin organic compound.

50. 14. A disinfectant as claimed in either claim 12 or claim 13, wherein the essential constituents include 1 to 50 parts by weight of the quaternary ammonium compound.

55. 15. A disinfectant as claimed in any one of claims 12 to 14, wherein the essential constituents include 30 to 100 parts by weight of the aliphatic dialdehyde.

16. A disinfectant as claimed in any one of claims 12 to 15, when appendant to either claim 2 or claim 3, wherein the essential con-

stituents include 1 to 20 parts by weight of the emulsifier.

17. A disinfectant as claimed in claim 16, wherein the essential constituents include 2 to 10 parts by weight of the emulsifier. 60

18. A disinfectant as claimed in any one of claims 12 to 17, when appendant to either claim 4 or claim 5, wherein the essential constituents include 0.1 to 10 parts by weight of the further constituent. 65

19. A disinfectant as claimed in claim 18, wherein the essential constituents include 0.6 to 3 parts by weight of the further constituent. 70

20. A disinfectant as claimed in any one of the preceding claims, comprising a liquid carrier medium carrying the essential constituents.

21. A disinfectant as claimed in claim 20, which comprises 5 to 1000 parts by weight of the essential constituents and 9000 to 9995 parts by weight of the carrier medium. 75

22. A disinfectant as claimed in claim 21, which comprises 10 to 300 parts by weight of the essential constituents and 9700 to 9990 parts by weight of the carrier medium. 80

23. A disinfectant as claimed in any one of claims 20 to 22, wherein the carrier medium comprises water. 85

24. A disinfectant as claimed in any one of claims 20 to 22, wherein the carrier medium comprises an alcohol.

25. A disinfectant as claimed in claim 24, wherein the carrier medium further comprises water. 90

26. A method of producing a disinfected fabric, comprising the step of applying to a fabric a disinfectant as claimed in any one of the preceding claims. 95

27. A method of producing a cleaned and disinfected product, comprising the step of applying to a product a cleaning agent in combination with a disinfectant as claimed in any one of claims 1 to 25. 100

28. A method as claimed in either claim 26 or claim 27, wherein said applying step comprises spraying the disinfectant on to the fabric or product.

29. A disinfectant as claimed in claim 1, and substantially as hereinbefore described with reference to any one of Examples 1 to 7. 105

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